# ENERGY OVERVIEW - FINLAND

## I. Statistical Information -- Primary Energy Consumption

| 2000 | Ktoe (1) | % |
|---|---|---|
| Coal | 3 500 | 11 |
| Petroleum | 8 300 | 27 |
| Natural Gas | 3 400 | 11 |
| Hydro | 1 200 | 4 |
| Nuclear | 5 600 | 18 |
| Renewable | 8 800 | 29 |
| TOTAL | 30 800 | 100 |

## II. Evaluation of Sector -- Electrical power Systems, Oil and Gas field machinery and Services and Renewable Energy Equipment

A) On a scale of 1 (low) to 5 (high), evaluate the priority given by the host government to energy development: 5

B) On a scale of 1 (low) to 5 (high), evaluate country's receptivity to U.S. products & services: 3

C) On a scale of 1 (heavy) to 5 (little), evaluate competition for U.S. exporters from local domestic suppliers: 2

D) On a scale of 1 (heavy) to 5 (little), evaluate competition for U.S. exporters from third-country suppliers: 2

E) On a scale of 1 (severe) to 5 (little), evaluate overall effect of trade barriers on U.S. exports of products and services: 5

## III. Narrative Information

On November 15, 2000 Teollisuuden Voima (TVO) submitted an application in principal concerning construction of a new nuclear plant in Finland. The decision will be made by the Parliament in May, 2002.

In 2001, an amount of energy corresponding to a total of 31 million tons of oil (Mtoe) was used in Finland. Industry's share of end-use of energy was 50%, with 23% going for heating buildings and 16% for transport. The total consumption of electricity was 81.6TWh, of which industry used more than a half and households nearly a quarter.

A typical feature of Finland's energy production is the large proportion of co-generated heat and power both in the district heating of communities and within industry. Another

characteristic feature is industry's own electricity generation: it gets more than a half of the electricity it needs from its own power plants or as a byproduct of processes.

Finland is dependent on imported energy. Domestic sources and fuels – hydro power, peat, wood and wastes, cover less than a third of total consumption. Bioenergy and other renewable sources of energy accounted for about a quarter of Finland's energy supply in 2000, giving Finland a top ranking amongst the world's industrialized countries (the average figure for EU is 6%). Within industry, biomass represents about a half of the fuel consumed.

Finland has deregulated its energy market at a fast pace. In addition, international development of the energy field will make the operating environment increasingly open. The government's role in steering energy policy will become more important and will have a greater influence through international cooperation.

Consumption of oil increased in the 1960s, but the trend came to a halt and headed downward during the energy crises in the 1970s. At that time, a broader energy repertoire was created thanks to domestic peat and other sources of imported energy, such as natural gas, nuclear energy and imported electricity. By means of diversified energy production and decentralized imports of different sources of energy, Finland is able to ensure an adequate and uninterrupted supply of energy.

At present Finland utilizes a total of ten different sources of bioenergy and renewable domestic energy. They account for nearly a third of the total energy consumption. The most important of these sources are the forest industry's black liquors and wood wastes as well as hydro power, fuel peat and fuel wood. Solar and wind power, recycled fuels and separately cultivated crop biomasses are used on a smaller scale and partly still at research and testing stages.

The co-generation of heat and power has been consistently built up in Finland. Combined production of power and heat is one of the most effective ways of improving efficiency of the energy economy and reducing greenhouse gases and other emissions. By international standards Finland is a pioneer in this area. District heating is almost 80% co-generated. In the future, Finland will strive to make full use of opportunities to build combined electricity and heat production. However, the scope for increasing co-generation is relatively limited.

**Electric Power Generation and Transmission Equipment (ELP)**

| **2000** | **Capacity** | **Production** |
|---|---|---|
| MW | Gwh | |
| Thermal | 9 690 | 31 530 |
| Hydro | 2 340 | 14 080 |
| Nuclear | 2 640 | 21 580 |
| Total | 14 670 | 67 190 |

Electricity generation in Finland has a decentralized structure. The total domestic electricity generation capacity is about 15 000 Mwe. There are about 400 power plants in the country half of which are hydroelectric. About 120 companies are involved in electricity generation and distribution. Fortum Oyj produces about 40% of Finland's electricity. Industry and its electricity-producing firms have about the same share. The share of local and regional energy companies is about 15%. In addition, Finland imports electricity from Russia and Sweden to satisfy its remaining energy requirements.

On June 1, 1995, the new Electricity Market Act brought open competition to Finland's electricity market. The goal has been to enhance operation of power utilities to meet foreign competition. At the first stage, the parties involved were large users with a power requirement of over 500 kW.

Since the beginning of 1997, small users were also allowed to purchase electricity on the open market. Due to the fact that households generally don't have the technical capability to invite competitive tenders from electricity distributors, the position of small users was improved by creating a system based on type loading curves. Consumer protection legislation was also developed to safeguard the interest of small consumers.

In the new situation, there was a need to improve monitoring of power grid operations because of their monopolistic nature. To accomplish this, a separate monitoring authority called Electricity Market Authority was established. The transmission of electricity over national grid as well as the boundary interfaces with Sweden, Norway and Russia are managed by a new grid company, Finnish Power Grid, which is owned by two major producers, the Finnish Government and institutional investors.

Finland's electricity markets have a wide spectrum ranging from two indigenous power producing, transmission and wholesale companies – Fortum - Imatran Voima Group (IVO) and the industry-owned consortium Pohjolan Voima Group (PVO) - to about 130 decentralized suppliers and deliverers. The companies are very different in structure and in the way they operate.

Combined production of power and heat has offered low-cost energy to both industry and communities. Finnish heavy industry ranks high in Europe in terms of the share of electric power it generates for its own needs: two thirds of the electric power. Power generation by industry is versatile, consisting primarily of hydroelectric power, back pressure power and nuclear power.

Cities also produce electricity, mainly in their district heating stations. Up to a half of the producers operating in the electric power market produce energy for their own needs or for their own retail delivery. Independent power companies have had to compete with industrial manufacturers who operate their own energy production facilities.

Imports of electricity account for about 10% of total supplies. The importer, power supplier IVO has made its purchases from Russia and Sweden, partly by long-term contracts. Recently industrial enterprises have started making purchasing contracts directly with foreign power companies.

In 1998, big news in Finland's energy field was the creation of Fortum Corporation (IVO – Neste). The Ministry of Trade and Industry announced in 1997 that it intended to investigate opportunities for developing the two companies on a joint basis. The Ministry followed up with an announcement that IVO and Neste would be merged to form a 'competitive Nordic energy group' Fortum Corporation.

Fortum Corporation has combined the expertise of IVO Group and the Neste Group to create a new strong and competitive energy company. Listed on the Helsinki Stock Exchange, Fortum has operations all over the world and is one of the Nordic countries' leading energy companies.

## Oil & Gas Industry and Equipment Market

Between mid-1950 and mid-1970's Finland built its own oil refining and basic petrochemical industry capacity as a part of a national industrial, trade and energy policy. Oil product imports were regulated until the end of 1980's and the state-owned oil refining company Neste imported a large part of its oil in the framework of bilateral trade agreements with the former Soviet Union.

Today oil product imports have been deregulated. The only refiner in Finland, Fortum Corporation, faces free competition but has succeeded in keeping almost 80% of the oil product wholesale markets. Fortum has also a 40% share of oil product distribution. The main share of oil imports comes from the North Sea. Fortum also owns shares in oil exploration and production companies, mainly on the North Sea.

Imports of natural gas from Russia to Finland began in 1974. Presently, natural gas accounts for 11% of Finland's primary energy consumption. There are 918 kilometers of natural gas transmission pipelines in Finland. Today the natural energy pipeline extends from the eastern border to Southeastern and Southern Finland. Due to increase in demand for natural gas, the Finnish gas importer Gasum and the Russian exporter Gazprom have initiated investments on both sides of the Finnish-Russian border to build a pipeline.

Western Europe's growing imports of natural gas call for building new transmission routes. These natural gas transmission routes are of major importance to the development of the natural gas market. During 1998 Nordic cooperation led to the Nordic Gas Grid feasibility study, which was funded 50 % by the EU. The study shows that the project is technically viable and that it could be implemented in stages. These findings give encouragement to progress further with the Nordic Gas Grid.

## Renewable Energy Equipment (REQ)

At present Bioenergy and other renewable fuels (peat included) account for about a quarter of Finland's total energy production. The share is the highest in industrialized countries due to extensive use of bark, waste wood and black liquor.

The state-owned company Vapo accounts for over 90% of the production and sales of peat. Fuel peat is cheaper than imported coal in Finland. It is mainly used in large industrial co-generation plants and in the cities. The government has traditionally supported use of domestic fuels with tax incentives and other measures. Nowadays, the need for promotion and support is diminishing. Industrial waste fuels and peat have, in

particular, achieved the level of competitiveness that creates the preconditions for profitable use. In the future, the Finnish government will concentrate more on measures directed at research activities and promotion of energy-related technology. This is becoming an important export industry for Finland.

Finland has become competitive in using energy resources such as peat, waste wood, wind and solar energy. Especially solar and wind energy is expected to create opportunities for new innovative technologies, introducing also opportunities for U.S. suppliers.

## IV. Major Procurement or Private Projects on the Horizon

At present, the two Finnish nuclear power companies Fortum (IVO) and TVO are concentrating on modernization of the existing nuclear power plants.

Since commissioning of the existing nuclear power plant units in the early 1980's, 4 000 MW of new production capacity has been put to use. Most of this capacity has been combined electricity and heat generation for industry and district heating. The need for pure base load capacity has, however, increased correspondingly at the same time.

The growing need for base load capacity requires decisions. There are only two solutions, either nuclear or coal-fired power units. Due to a long process needed for the licensing and construction of a new nuclear plant, the decision has to be made in the near future.

Decisions on new nuclear capacity, whether to build a new plant or replace old plants, will be made on a case-by-case basis, taking the existing economic and safety-related circumstances into consideration. The future status of nuclear energy in Finland will also depend on international developments in this special field of energy. The Finnish Parliament will make a decision on the fifth nuclear plant in May, 2002.

The Finnish market offers some sales opportunities for U.S. small and medium sized companies. However, they are facing competition especially from Finnish manufacturers as well as other European companies in the European Union.

The best prospects for U.S. companies are cooperation with Finnish companies and in joint ventures e.g. oil pipeline prospects and in the Nordic Gas Grid in the future. One good example of successful cooperation was the Fortum (Neste) Porvoo co-generation gas-turbine plant that was inaugurated in 1998. The main gas turbines were delivered by EGT (European Gas Turbines) in cooperation with General Electric. Foster Wheeler Energy constructed the boilers.

Fortum, one of the leading energy companies in the Nordic countries is active in the oil, chemicals, gas and energy industries. Fortum is also active in Russia and the Baltic markets. Cooperation with Fortum e.g. in oil pipeline prospects and in the Nordic Gas Grid might create opportunities for U.S. oil and gas industry equipment producers.

## V. Major Trade Events / Fairs

Name: Energy 2003
Location: Helsinki Fair Center - Finland

Dates: Fall, 2003
Organizer: The Finnish Fair Corporation

## VI. Country's Methods of Procurement

In Finland open tenders are used according to European Union regulations as well as direct purchase by the private energy sector. It is an advantage for foreign companies to have a local agent/distributor or a sales office to provide marketing and service within the country. Some foreign companies have also entered the Finnish market by acquiring a local manufacturer.

## VII. Means of Financing Procurement

The Finnish financial market is a typical European environment where banks and financing institutions have a dominant role. Financing is also available through the government financing systems. Nordic Investment Bank grants investment loans for Nordic projects and also finances projects in third countries.

## VIII. Points of Contact

U.S. Department of Commerce
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Contact: Ms. Tarja Kunnas, Commercial Specialist

### Host Government

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Tel: 358-9-1601
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Contact: Mr. Taisto Turunen, Director General

## IX. Additional Sources of Information

### Research Institutes:

Technical Research Center of Finland (VTT)

VTT Energy
P.O. Box 1000
FIN-02 044  VTT
Tel: 358-9-4561
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**Universities and Research Centers:**

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Tampere University of Technology
P.O. Box 527
FIN-33101 Tampere, Finland
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P.O. Box 20
FIN-53851 Lappeenranta, Finland
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**Major Power Companies:**

Finnish Power Grid
P.O. Box 530
FIN-00101 HELSINKI
Tel: 358-9-395 5000
Fax: 358-9-395 5196
www.fingrid.fi

Fortum Corporation
P.O. Box 1
FIN-00048 FORTUM
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Fax: 358-9-6185 8200
www.fortum.com

Fortum Oil and Gas Oy
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Fortum Power and Heat Oy
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Confederation of Finnish Industry and Employers
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Finnish District Heating Association
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Finnish Electricity Association Sener
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